Identifying Co-ops and Farmers as Illicit Sources of Anhydrous Ammonia for Methamphetamine Makers

For Final Report

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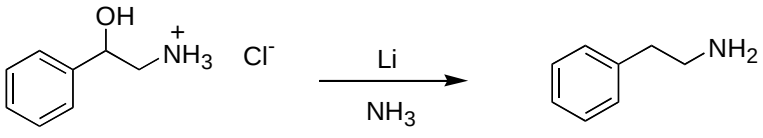
Methamphetamine production in Iowa and its neighboring states has become a problem. Thieves have been stealing ammonia tanks from co-op facilities or nurse tanks in the fields of farmers. However, an increasing problem is that the employees of the farmers or co-ops have been selling the tanks to meth makers. Right now there is no way of determining whether this is happening.

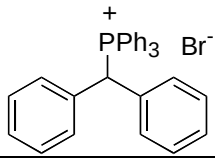
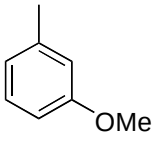
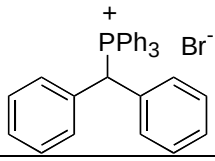
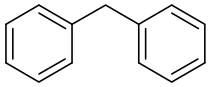
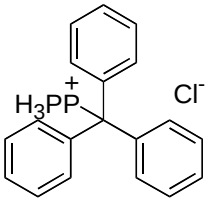
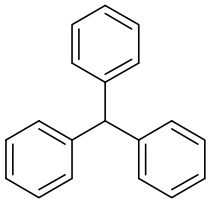
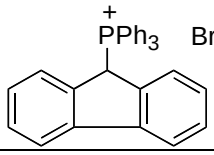
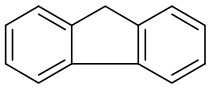
The goal of this project is to make a salt that will help in the identification of employees of specific co-ops and farmers who are providing the ammonia to meth makers. The salt must be able to be stored in an ammonia tank at very small quantities, give different HPLC (High Performance Liquid Chromatography) or GC (Gas Chromatography) signals, not be harmful to humans and farmer's fields, and be able to produce the detection compound during the synthesis of methamphetamines. Since the production of methamphetamine is illegal, a model compound (2-hydroxy-2-phenylethylamine hydrochloride) that has been developed by our group in an earlier experiment will be used. The reaction of this compound gives 2-phenethylamine, which is structurally related to meth and is shown in Scheme 1.

Scheme 1



The salt that is to be used must be able to undergo reduction in the presence of lithium and ammonia to produce the detection compound, an example of which is shown in Scheme 2. The detection compound must be soluble in ethyl ether or mineral spirits, the organic solvents used to extract the methamphetamine. The reaction of the salt must not prevent the meth reaction. The salts used as the detection compound (Table 1) were provided by Dr. Kraus's lab.

Table 1[a]

Entry	Salt[b]	Detection Compound	Retention Time (min)	Detection by GC?
1			5.90	No
2			9.43	Yes
3			13.73	Yes
4			10.80	Yes

[a] The retention time of the model compound in Scheme 2 was 6.16 min.
[b] 0.1 mole % in anhydrous ammonia.

The Verkade Group developed the procedure that is to be used for the reaction shown in Scheme 2. The procedure calls for 20 mmol of the starting material model compound and 0.1 mole % of the salt to be placed in a 500 mL flask equipped with a side arm and with a stir bar. Ammonia is then passed through the flask until there is no air left in the flask. Then the flask is put into a dry ice/acetone bath to condense the ammonia.

Once 200 mL of ammonia has been condensed, 0.76 grams of lithium cut into six pieces is charged to the flask and the mixture is stirred until all the lithium is dissolved (about 30 minutes). The ammonia is then allowed to evaporate in a fume hood after which the reaction mixture is extracted with 400 mL of ethyl ether. The ether layer is then filtered. Evaporation of the ether layer leaves a mixture of the model compound and the detection compound. A GC-MS experiment was carried out on this residue to determine if the detection compound could be detected. The GC parameters were 60°C for 1 minute followed by raising the temperature to 280°C over a fifteen-minute period. The 280°C temperature was maintained for 5 minutes.

In entry 1 of Table 1, it is seen that after the reduction, the detection compound itself was not formed, but its reduction production toluene was. The retention time of toluene is in that of the dead volume of the GC.

In conclusion, we have been able to successfully develop three salts that reduce under the conditions of the illicit Nazi meth synthesis, whose reduction products are detectable by GC analysis. The concentration of these salts (0.1 mole percent) in liquid ammonia is very minimal, and they probably could even be lowered.

Two of the most promising compounds, Entries 3 and 4 in Table 1, were sent to Criminalist Nila Bremer at the Iowa DCI laboratories. She attempted to duplicate our results, but obtained inconclusive data. Unfortunately, funding for the project had expired and consequently no more material could be sent to her for refining her experiments.